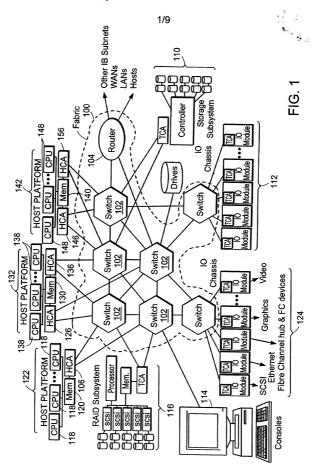Title: Remote Memory Address Translation
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FIG. 1

Title: Remote.Memory Address Translation
Inventor(s): Dearth et al.
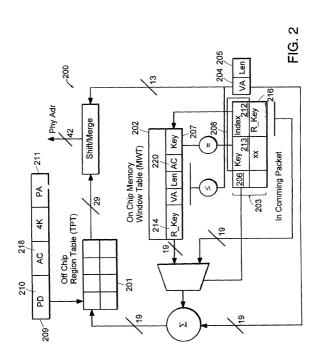Application No.:10/007154
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FIG. 2

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FIG. 3

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```
                ┌──────────────┐
                │    BEGIN      │
                └──────────────┘
                       │
                       ▼
        ┌──────────────────────────────┐
        │  register memory region and  │
        │    memory window with OS     │
        │            401               │
        └──────────────────────────────┘
                       │
                       ▼
        ┌──────────────────────────────┐
        │    allocate memory window    │
        │            402               │
        └──────────────────────────────┘
                       │
                       ▼
        ┌──────────────────────────────┐
        │   bind memory window to      │
        │      memory region           │
        │            403               │
        └──────────────────────────────┘
                       │
                       ▼
                ┌──────────────┐
                │     END       │
                └──────────────┘
```
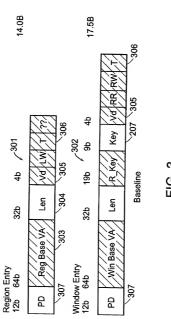
FIG.4

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BEGIN

call register memory function
501

find set of consecutive entries in memory region table
502

entries found? — NO

YES

make bindable? — NO

YES

find location in memory window table for memory region record
503

location found? — NO

YES

free region found? — NO → error

YES

write physical address in memory region table
505

write memory region record in memory window table
506

return MR handle and keys
507

END

write physical address in memory region table
504

END

FIG.5

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```
            ( BEGIN )
                |
                v
  +---------------------------+
  | call memory window        |
  | allocation function       |
  |         601               |
  +---------------------------+
                |
                v
  +---------------------------+
  | find unused entry in      |
  | memory window table       |
  |         602               |
  +---------------------------+
                |
                v
  +---------------------------+
  | write PD valve, intialize |
  | length set fields         |
  |         603               |
  +---------------------------+
                |
                v
  +---------------------------+
  | return MW handle and      |
  | unbound window R_key       |
  |         604               |
  +---------------------------+
                |
                v
             ( END )
```
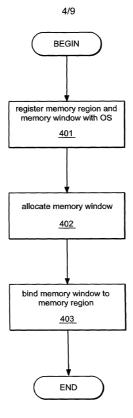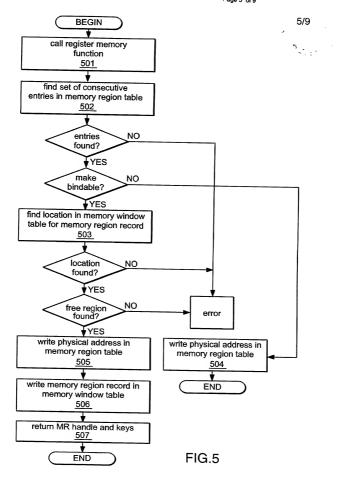
FIG.6

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```
                    ( BEGIN )
                        │
                        ▼
          ┌──────────────────────────┐
          │  call bind request function │
          │            701             │
          └──────────────────────────┘
                        │
                        ▼
          ┌──────────────────────────┐
          │    read index pointers     │
          │            702             │
          └──────────────────────────┘
                        │
                        ▼
          ┌──────────────────────────┐
          │  compare protection domains │
          │            703             │
          └──────────────────────────┘
                        │
                        ▼
                  ╱ PD       ╲        NO
                 ╱ values match? ╲──────────────┐
                  ╲             ╱                │
                    ╲         ╱                  │
                      │ YES                      │
                      ▼                          │
          ┌──────────────────────────┐          │
          │  compare virtual addresses │          │
          │       and lengths          │          │
          │            704             │          │
          └──────────────────────────┘          │
                        │                        │
                        ▼                        │
                  ╱ addresses  ╲      NO          │
                 ╱ and lengths OK? ╲──────────────┤
                  ╲             ╱                  │
                      │ YES                        │
                      ▼                            │
          ┌──────────────────────────┐            │
          │    check access value      │            │
          │            705             │            │
          └──────────────────────────┘            │
                        │                          │
                        ▼                          │
                  ╱ access OK? ╲    NO             │
                 ╱             ╲──────────────────┤
                  ╲           ╱                    │
                      │ YES                        │
                      ▼                            │
          ┌──────────────────────────┐            │
          │  update memory window      │            │
          │      table entry           │            │
          │            706             │            │
          └──────────────────────────┘            │
                        │                          │
                        ▼                          ▼
          ┌──────────────────────────┐  ┌──────────────────┐
          │   generate window R_key    │  │  generate error  │
          │            707             │  │       708        │
          └──────────────────────────┘  └──────────────────┘
                        │
                        ▼
                    (  END  )
```
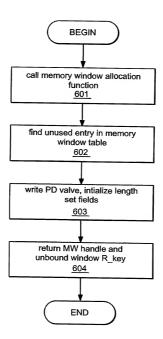
FIG.7

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801

Region Entry
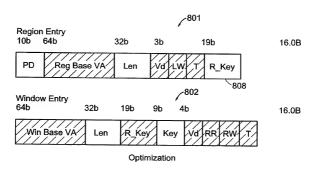
10b	64b	32b	3b			19b	16.0B
PD	Reg Base VA	Len	Vd	LW	T	R_Key	

808

802

Window Entry

64b	32b	19b	9b	4b				16.0B
Win Base VA	Len	R_Key	Key	Vd	RR	RW	T	

Optimization

FIG. 8

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FIG. 9